

Subnational variation in forest protection in the Argentine Chaco

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ABSTRACT

In a context of booming commodity prices, what factors drive subnational authorities to implement forest protection regulations in active agricultural frontiers? Focusing on one of the world's deforestation hotspots, the Argentine Chaco Forest, we argue that subnational variation in the implementation of forest protection legislation is driven by governors' attempts to avoid conflict produced by agricultural expansion. Through process tracing, we show how governors' implementation decisions—regarding both the design and enforcement of provincial regulations—sought to mitigate pressures from large producers opposed to clearing restrictions and from various groups contesting agricultural expansion. As the power of these actors varies across provinces, governors' conflict avoidance strategies resulted in markedly different subnational regulations as well as contrasting levels of enforcement and deforestation. We substantiate our argument through an empirical strategy that combines department-level geocoded data on deforestation and levels of forest protection in the Argentine Chaco with extensive fieldwork and interviews in the core provinces in which the forest is located. Our findings aim to contribute to academic debates in political science and environmental science on the determinants of subnational policy and deforestation, respectively, and have the potential to inform both donors and policymakers about the factors shaping the uneven impact of decentralized arrangements to combat climate change.

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1. Introduction

The commodity boom of the 2000s intensified environmental degradation and conflict over natural resources across the developing world. In active frontiers in South America, ranching and soybean cultivation jeopardized native forestlands and the local communities subsisting on them. Most commodity-producing countries responded to this challenge by introducing forest protection legislation.¹ These institutions have imposed restrictions on land use within a region that holds the highest potential for agricultural expansion in the world (Graesser, Mitchell, Grau, & Ramankutty, 2015).² Given the prevailing view that institutions are weakly enforced in Latin America (Levitsky & Murillo, 2009, 2013), a key question concerns whether and under what conditions forest protection regulations are implemented at times of extraordinarily high commodity prices.

While environmental laws are the initiative of national authorities, their implementation generally falls under the responsibility of subnational governments.³ Comparative scholarship on Latin America suggests that implementation of national laws correlates with subnational state capacity (Amengual, 2016), the political alignment between national and subnational authorities (Niedzwiecki, 2018), and the electoral incentives of subnational politicians (Holland, 2016; Smulovitz, 2015). Similarly, studies of forest management have emphasized the impact of financial and electoral incentives on subnational forest governance (Andersson, Gibson, & Lehoucq, 2006). Research on deforestation in active frontiers in turn has found that the value of land drives variation in governments' efforts to protect forests, with subnational governments allocating stricter zoning to land that is less valuable for agricultural production (Nolte et al., 2017).

To investigate the circumstances that lead subnational authorities to effectively enforce forest protection legislation at times of market pressure for cropland expansion, we focus on the Argentine Chaco Forest, which represents 60 percent of the Chaco Americano, the largest forestland and biomass reservoir outside tropical areas in the southern hemisphere (Paolasso, Krapovickas, & Gasparri,

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¹ See Appendix B.

² It should be noted that we do not imply that these laws only reflect environmental concerns. They may also be influenced by agribusiness or other economic interests against conservation. See Faggin and Behagel (2017).

³ See Andersson, Gibson and Lehoucq (2006), Hibbard, Kilgore and Ellefson (2006), Nolte et al. (2017).

2012). As commodity prices spiked in the 2000s, cultivation expanded into forestlands virtually unrestrained. In 2007, during the heyday of the commodity boom, the Argentine Congress sanctioned a national forest protection regime (NFPR) in response to environmental activists seeking to curtail deforestation. The NFPR requires provinces to classify forestlands according to their conservation value, restrict land use in protected areas, and establish agencies to enforce the law.

Despite provincial governments' contradictory incentives to protect forests and expand production, the NFPR did limit deforestation (see Nolte et al., 2017). However, there is remarkable sub-national variation in forest protection across the Chaco. The core Chaco provinces—where the lion's share of the forest is located and which account for most of the deforestation in Argentina—designed significantly different regulations and have displayed remarkable variation in deforestation rates since the NFPR's approval. Cross-provincial differences are not only consequential in environmental terms but are especially intriguing given similarities in economic development, state capacity, electoral competition, and alignment with the national government.

In explaining cross-provincial variation in forest protection, we argue that the combined pressure from large producers driving cultivation into forest areas and from local groups challenging the expansion of the agricultural frontier—here called conservationist coalitions—shapes governors' implementation choices. Governors engage in a strategy of *conflict avoidance*, granting concessions to competing interests in the design and enforcement of the law in order to prevent mounting discontent from destabilizing their governments. Hence cross-provincial variation in the power of producers and conservationist groups results in distinct provincial regulations and levels of enforcement within the Chaco.

Zoning and land-use regulations became critical issues in provincial politics due to the region's extensive parcels of cheap land available for soybean cultivation at a time of booming commodity prices. While large producers pressured for permissive regulations and nonenforcement of the NFPR, conservationists advocated strict implementation of the NFPR in order to contain deforestation and protect their economic activity and livelihoods from agricultural expansion.

Our argument on conflict avoidance helps account for variation in the implementation of the NFPR across the four core Chaco provinces—Chaco, Formosa, Santiago del Estero, and Salta. We find that when provincial conservationist groups are strong—pressing the state and engaging in policymaking—governors design and enforce strict regulations; this is the case with the province of Chaco. However, if both conservationist groups and large producers are powerful, governors design strict regulations to satisfy conservationists, creating a veneer of commitment with environmental goals, but enforcement of these regulations is low as governors attempt to respond to the demands of large producers. For local conservationists, it is easier to influence policy design than to control enforcement. In these cases, we observe both strict regulations and illegal deforestation (Santiago del Estero). If provincial conservationist groups are weak or not present, governors design regulations that are markedly favorable for agricultural and ranching expansion, even in contradiction with the NFPR (e.g., permissive land-use rules and zoning maps), and they fail to enforce these flawed rules effectively (Formosa and Salta).

While theories centered on organized actors and economic interests are not new,⁴ this is the first attempt to account for cross-provincial variation in forest protection within the Argentine Chaco by systematically analyzing stakeholders' pressures. Our the-

oretical framework adds to the literatures on forest protection and weak institutions in Latin America in two ways. First, it contributes to actor-centered approaches to forest governance (Krott et al., 2014)⁵ by theorizing how the power of competing actors and the strategic responses of governors in the form of institutional design and enforcement help account for variable levels of forest protection across Chaco provinces. Second, by disaggregating implementation of the NFPR into the design of provincial regulations and their enforcement, we identify the different ways in which forest protection can be enhanced or undermined across provinces. In doing so, we dialogue with studies that view implementation as a domain in which policy content is also shaped (e.g., Krott et al., 2014),⁶ and we add to the literature on enforcement by showing other sources of institutional weakness beyond politicians' decisions (not) to sanction non-compliance (see Holland, 2016).

This article is organized as follows. In the next section we discuss the relevant literature on forest protection and subnational policy implementation in weak institutional contexts. Section 3 presents our explanatory framework for the implementation of forest protection legislation as conflict avoidance and the theoretical expectations that we derive from this framework. Next, we describe our research design, methods, and data sources. Section 5 then presents and measures our dependent variable, subnational variation in the implementation of the NFPR in the Chaco provinces. The final sections present our empirical evidence. We employ process tracing based on multiple data sources, including fieldwork research in the four Chaco provinces, and quantitative analysis of an original department-level dataset to assess our argument and alternative explanations. Two in-depth case studies of NFPR implementation in Chaco and Santiago show how the mechanisms identified in our explanatory framework account for governors' implementation choices.

2. Subnational politics of forest protection

Studies of decentralized forest management have emphasized the importance of institutional incentives to account for subnational variation in forest protection. Focusing on Latin American cases, Andersson et al. (2006) sustain that mayors will more effectively manage their forests when they have greater decision-making powers and when they perceive that financial and political benefits, such as reelection, are associated with forest governance. In line with environmental research, scholarship on institutional weakness in Latin America (Levitsky & Murillo, 2009, 2013) contends that uneven within-country implementation of the law results from subnational variation in either state capacity (Amengual, 2016) or politicians' electoral incentives to relax enforcement (Holland, 2016).

Scholars further note that the more leeway subnational governments have to define the content of laws and rights, the higher the chances are that local politics will shape these institutions producing subnational inequality in enforcement (Smulovitz, 2015). This is consistent with scholarship on deforestation (Nolte et al., 2017:31) and forest policy (Koontz, 2002: 16–7), which suggests that subnational governments are more likely than national governments to prioritize local interests over the protection of the environment.

In the Argentine Chaco, state capacity, access to financial resources for forest governance, and electoral incentives, however, do not explain variation in forest protection. Chaco provinces present similarly low levels of state capacity and electoral competi-

⁴ Concerning forest governance see Krott et al. (2014), Koontz (2002). On the impact of contentious politics on deforestation, see Brown et al. (2016).

⁵ Local interests and actors are also relevant in Faggin and Behagel (2017) and Koontz (2002).

⁶ For a review of implementation literature, see Hupe and Sætren (2014). See also Pressman and Wildavsky (1984).

tion, and count on comparable funds to implement the NFPR, but they exhibit varied regulatory frameworks and deforestation rates.⁷ This makes them excellent cases to explore other drivers of subnational policy variation in a context of weak institutions.

Scholarship on forest protection in the Argentine Chaco has mainly studied the design of subnational regulations (e.g., zoning maps) separately from their enforcement (e.g., deforestation rates) (García Collazo, Panizza, & Paruelo, 2013; Schmidt, 2010; Seghezzo et al., 2011).⁸ In this study we seek to contribute to this literature by analyzing both aspects of the implementation process together. At the same time, while the existing literature proposes either economic (Nolte et al., 2017) or political variables (Seghezzo et al., 2011) to account for forest protection, our analysis incorporates both, drawing from quantitative as well as qualitative data sources.

Building on the preceding discussion, we pay special attention to two factors that have received less attention in the recent literatures on enforcement of forest protection regulations in the Argentine Chaco and on weak institutions more generally: economic interests and land structure. At times of agricultural expansion, forest protection legislation affects landholders and producers who bear the cost of regulations that restrict land use and depress expected profits. While the classic literature on landowners and economic elites emphasizes how these actors typically oppose redistribution in the form of taxes and expropriation (Acemoglu & Robinson, 2006; Boix, 2003), their role in the implementation of forest protection legislation in active frontiers remains undertheorized. At the same time, the expansion of the agricultural frontier threatens actors whose livelihoods and economic activity depend on the forest and who therefore may become supporters of forest protection (Martinez-Alier, 2013). We integrate both producers' and conservationists' interests in our theoretical framework with the aim of accounting for subnational variation in forest protection in the Chaco and contributing to the broader literature on enforcement in weakly institutionalized contexts.

3. Subnational interests and the implementation of forest protection

We argue that the combined pressures of large producers seeking to expand crops into forest areas and of groups resisting the expansion of the agricultural frontier—here called conservationist coalitions—shape governors' implementation choices and result in variation in provincial regulations and their enforcement. In line with studies of decentralized forest management, we assume that subnational executives have no inherent preferences regarding forest governance (Andersson et al., 2006) but rather prioritize subnational political and economic interests over environmental protection (Koontz, 2002). In the context of booming international prices, forest protection legislation is opposed by those interested in the expansion of agriculture into forestlands and supported not only by environmentalists but also by those whose own economic activity and livelihoods are threatened by forest clearings.

While forest protection laws affect relevant economic interests, they also provide governors with distributive tools (regulations, sanctions) that can be used to appease conflict.⁹ In active deforestation frontiers, governors may pursue a strategy of *conflict avoidance*, granting concessions to competing conservationist and agricultural interests in both the design and enforcement of forest protection laws. Governors can use critical *design features*, such as zoning maps and land use regulations, as well as *positive incentives* (e.g., environ-

mental payments) and *negative incentives* (e.g., sanctions), to prevent discontent from destabilizing their administrations. The design and enforcement of these tools are therefore shaped not by environmentalism but rather by power dynamics, and results in variable levels of deforestation.

Below we present the main actors identified in our framework—governors, large producers, and conservationist coalitions—and lay out the expectations derived from our framework about the implementation of the NFPR in the Chaco.

3.1. Governors and subnational interests in the Argentine Chaco

3.1.1. Governors

The NFPR requires provinces to enact implementation regulations, or a Territorial Classification of Native Forests (OTBN), comprising land use regulations and a zoning map. Although OTBNs have to be designed through a participatory process and approved by the provincial legislature, governors are fundamental actors in the implementation of the NFPR. They have the institutional power to draft laws and regulations, push these laws through provincial legislatures, and use veto and decree powers to modify them. Scholarship on Argentina's federal system emphasizes the limited division of powers at the subnational level (Ardanaz, Leiras, & Tommasi, 2014; Gibson, 2010). Governors have control over critical institutional and economic resources, which allows them to weaken the opposition (Gibson, 2010), influence the political careers of their legislators, and limit intra-party dissent (Jones, 2008).

3.1.2. Large producers

Large producers are here understood as landowners and investors seeking to exploit production and real estate opportunities with parcels of at least 2500 ha.¹⁰ Motivated by spiking prices during the commodity boom, large producers drove soybean cultivation into previously unexploited areas. The expansion of agriculture favored real estate speculation, incentivizing forest clearings as land prices climbed.¹¹ Producers were lured by the relatively lower land prices in the Chaco provinces, the availability of large farms—which allowed them to maximize profit margins—and the absence of actual restrictions on forest clearings prior to the sanctioning of the NFPR.

In forest-rich provinces, large producers have preferred OTBNs with permissive regulations and lax enforcement and they have lobbied provincial governments to water down the conservationist aspects of the OTBNs, either by acting individually or through their organizations.¹² The comparative literature distinguishes between two sources of producers' power: structural, which results from their uncoordinated profit-maximizing economic decisions, and instrumental, which involves collective action—e.g., ties with political parties, organizational cohesiveness, lobbying, and campaign funding (Fairfield, 2015; Hacker & Pierson, 2002; Lindblom, 1977). In highly unequal societies such as those of Latin America, land has historically been a source of both structural and instrumental power.¹³ During the commodity boom, large landowners in the Chaco gained formidable structural power, which increased their access to the state mainly through informal channels, such as party and family ties. These linkages were facilitated by the historical alliance of conservative provincial politicians with the labor-based Peronist Party

⁷ Empirical evidence is presented in Section 6.

⁸ Nolte et al. (2017) is a notable exception.

⁹ On institutions, see North (1990) and Knight (1992).

¹⁰ About five times the size of the average farm in Argentina (588 ha).

¹¹ Land price sources in Appendix D.

¹² Although producers are organized in associations in the four provinces, our interviews with both association leaders and politicians indicate that contacts between them generally take place through informal channels often facilitated by partisan and/or family ties.

¹³ Latin America has the highest land inequality in the world (Vollrath, 2007). Argentina, with a land Gini of 0.83, is no exception (Guereña, 2016).

(PJ), which governed in the Chaco provinces and nationally during most of the 2000s (Gibson, 1997; Mora y Araujo, 1980).

Because of the deeply intertwined nature of large landowners' structural and instrumental power, measuring their separate effects on policymakers' decisions is hard. We assume large landowners have greater capacity to influence policymaking in provinces where they control larger shares of provincial productive land, which increases both their structural and instrumental power. Interviews with high-ranking politicians and producers' associations leaders in the four provinces confirmed that both sources of power were at play.¹⁴ Provincial authorities anticipated powerful producers' resistance to forest regulations via disinvestment (see Fairfield, 2015) and through lobbying, party ties, and campaign contributions.¹⁵

3.1.3. Conservationist coalitions

Conservationist coalitions are organized societal and economic interests opposing the expansion of the agricultural frontier over forest areas.¹⁶ These actors may advance environmental principles or may act on self-interest. In the core Chaco provinces, conservationists are primarily concerned about the negative effects of soy expansion on their own economic activity and livelihoods. These groups include timber producers, peasants, and indigenous communities, and they constitute a conservationist coalition when they engage in sustained collective action and press for the strict implementation of the NFPR,¹⁷ even if they do not act together.

Conservationist groups have connected forest protection to land rights, the recognition of indigenous communities, and the preservation of indigenous cultures and livelihoods—what social movement scholars call the “environmentalism of the poor” (Martínez-Alier, 2013). Despite the common challenges that conservationists face in the Chaco, these groups share with other environmental coalitions the localized definition of their claims (Svampa, 2015), the absence of cross-provincial solidarity with similar actors, and the difficulty of scaling up and connecting in a sustained way with national and transnational movements (Anguelovski & Martínez Alier, 2014). The OTBN's participatory process provided a venue for conservationists to influence its design. Aside from leveraging institutional channels, conservationist coalitions have also engaged in contention to oppose land clearings and the eviction of peasants without land titles.

3.2. Theoretical expectations

We derive a number of expectations about the implementation of the NFPR from our framework on conflict avoidance. We expect that when governors face large producers with formidable vested interests in the expansion of agriculture, they will relax the implementation of the NFPR, either because they face direct political pressure from producers or anticipate disinvestment or retribution. In these circumstances, governors are likely to design a permissive OTBN and weaken its enforcement by failing to build adequate monitoring capacity and apply sanctions. By contrast, when governors face a conservationist coalition, they will be motivated to design a stricter OTBN, develop monitoring capacity, and impose sanctions on illegal clearings.

¹⁴ See Appendix G for full list of interviews.

¹⁵ According to a senior politician in Salta, “producers finance political parties ... politicians' campaigns” and “with the exception of the Partido Obrero [a minority left party] no politician here would oppose producers” (authors' interview, not for attribution).

¹⁶ The term “coalition” is applied to sectors with common interests whether they act in concertation or not. See Murillo (2001).

¹⁷ Consejo Provincial de Bosques (2008).

Table 1
Governors' choices: design and enforcement.

Powerful Large Producers	Conservatism Coalition	
	Yes	No
Yes	Strict Design; Low Enforcement	Permissive Design; Low Enforcement
No	Strict Design; High Enforcement	

These two factors combine as displayed in Table 1, resulting in the following incentive structure and expected outcomes. When they face powerful large producers and no conservationist coalition (top, right), governors will likely design a permissive OTBN and enforce it lightly in response to producers' demands and/or their perceived preferences (i.e., structural power) out of fear that they will lose investments and public support.

When they face a conservationist coalition in a context in which large producers do not control a substantial share of the province's productive land, governors will be motivated toward conservatism (bottom, left). Under these circumstances, governors will incorporate the demands of conservationist groups and design a stricter OTBN. Governors in these cases are more likely to invest in capacity-building to enforce the law, as the conservationist coalition is more or less actively involved in denouncing illegal forest clearings and producers are not sufficiently powerful to undermine enforcement. Moreover, governors will likely favor actors within the conservationist coalition in the allocation of compensatory funds for environmental services.

Governors may also face both powerful large producers and a conservationist coalition (top, left). In these cases, they will cater to both sectors, as conflict and the threat of instability will likely emerge forcefully with the expansion of croplands. To respond to the conservationist coalition, governors will design a strict OTBN, as watchful conservationist interests will make it difficult for the government to water down its design. However, to cater to producers, governors will relax enforcement, which is harder for conservationists to control. In order to quell discontent with low enforcement, governors will likely provide conservationist actors with compensatory funds. We do not expect to find cases without both a conservationist coalition and large-scale producers among forest-rich provinces in the Chaco in the context of a commodity boom.

4. Research design, methods and data

This study employs a subnational comparative research design that combines qualitative and quantitative data to assess the argument proposed and evaluate alternative explanatory factors. We focus on the core Chaco provinces: Chaco, Formosa, Salta, and Santiago del Estero, which exhibit significant variation in deforestation levels but are similar in terms of economic development, state capacity, partisan alignment, and electoral competition.

Process tracing allows us to assess whether cross-provincial variation in the implementation of the NFPR responds to a logic of conflict avoidance or whether other explanatory factors are at play.¹⁸ Process tracing is based on multiple data sources, including fifty-six elite interviews conducted between 2014 and 2017 with sixty-two key national and provincial-level informants—governors, legislators, peasant and indigenous movement leaders, representatives of producers' associations, and environmental activists—and

¹⁸ On process tracing see Collier (2011), Bennett and Checkel (2015), Fairfield and Charman (2017).

on our analysis of documents about the design and enforcement of provincial-level regulations.¹⁹

We further conduct a quantitative analysis to test our claim that variation in enforcement—measured as deforestation levels—is explained by agricultural producers' power. We rely on an original data set of department-level georeferenced deforestation, cultivated area, self-coded land prices, land structure, self-coded OTBN protection levels, and distance to the agricultural core in the 170 departments of the Argentine Chaco.²⁰

In order to show how the mechanisms identified in our framework shape governors' choices, we also present two in-depth case studies of the NFPR's implementation, focusing on Chaco and Santiago del Estero. These provinces present contrasting levels of deforestation and large landowners' power but in both cases there is a powerful conservationist coalition, which in our framework is associated with a stricter OTBN. Therefore, the comparison between Chaco and Santiago allows us to differentiate the effect of each our two explanatory factors—the presence of a conservationist coalition and large producers' power—on the implementation of the NFPR.

4.1. The case

The Argentine Chaco is one of the world's deforestation hot-spots. In order to assess the implementation of the NFPR, we focus on the four core provinces that comprise the majority—63 percent—of the forest and that have at least 50 percent of their provincial area covered by forest. Since the enactment of the NFPR, these provinces have concentrated 75 percent of all deforested area in Argentina (AGN: 2017, 114).

Although illegal logging historically affected the Argentine Chaco, the approval of genetically modified seeds in 1996 and the spike in international soy prices in the 2000s drove both commercial agriculture and ranching displaced from other areas into the Argentine Chacos forestlands.²¹ Map 1 illustrates the relationship between soy cultivation in the Argentine Chaco for the period 20012008, prior to the NFPRs implementation, and the evolution of deforestation for the 20012012 period. There is a positive geographic correlation (30 percent) between deforested area (dark dots) and soybean cultivation at the department level; this correlation is stronger (64 percent) if we restrict our analysis to departments within the four core Chaco provinces.²² Between 2006 and 2016, these provinces lost around 2.5 million hectares of forest, or the equivalent of 9.7 percent of their total forestland.²³

In November 2007, the Argentine Congress passed Law 26,331, establishing a national regime for the protection of native forests (NFPR). The bill was promoted by environmental NGOs and met vigorous opposition from representatives of the Chaco provinces.²⁴ Due to overrepresentation in the Senate, legislators from Chaco provinces were able to introduce key changes to the bill that increased the discretion of subnational authorities in its implementation. The most relevant changes were the creation of a compensatory fund to pay producers for their environmental services and build provincial enforcement capacity, and the introduction of a wide scale for fines that allowed governors to impose modest penalties for infractions.²⁵

¹⁹ For details on sampling, the documents analyzed and interviewees, see Appendix G.

²⁰ Data sources and coding criteria are listed in Appendix C.

²¹ See De Sy et al. (2015), Gasparri and Grau (2009) and Paolasso et al. (2012).

²² Authors calculation, significant at the 1 percent level.

²³ SAYDS (2015, 12); MARYDS (2017, 7).

²⁴ On pre-existing institutions, see Burns and Giessen (2016).

²⁵ Authors interview with Salta senator Sonia Escudero, who proposed the fund (Salta, July 10, 2015).

5. Subnational variation in forest protection across Chaco provinces

The NFPR required provinces to enact implementation regulations, or a Territorial Classification of Native Forests (OTBN), comprising land use regulations and a zoning map in agreement with the NFPR. Forests had to be classified according to their conservation value into three categories that allow for different economic activities—no transformation in high conservation (red) areas, sustainable management in medium conservation (yellow) areas, and transformation for agriculture in low conservation (green) areas. The NFPR banned new deforestation permits until an OTBN was approved. In a context of weak institutions (Levitsky & Murillo, 2009), in which provincial governments have room to introduce biases in the design of provincial regulations and relax the enforcement of the law, we analyze variation in the implementation of the NFPR, focusing on both the OTBNs' design and on the NFPR's enforcement. These two aspects of implementation are used by governors to respond to two critical stakeholder groups: conservationists and large producers.

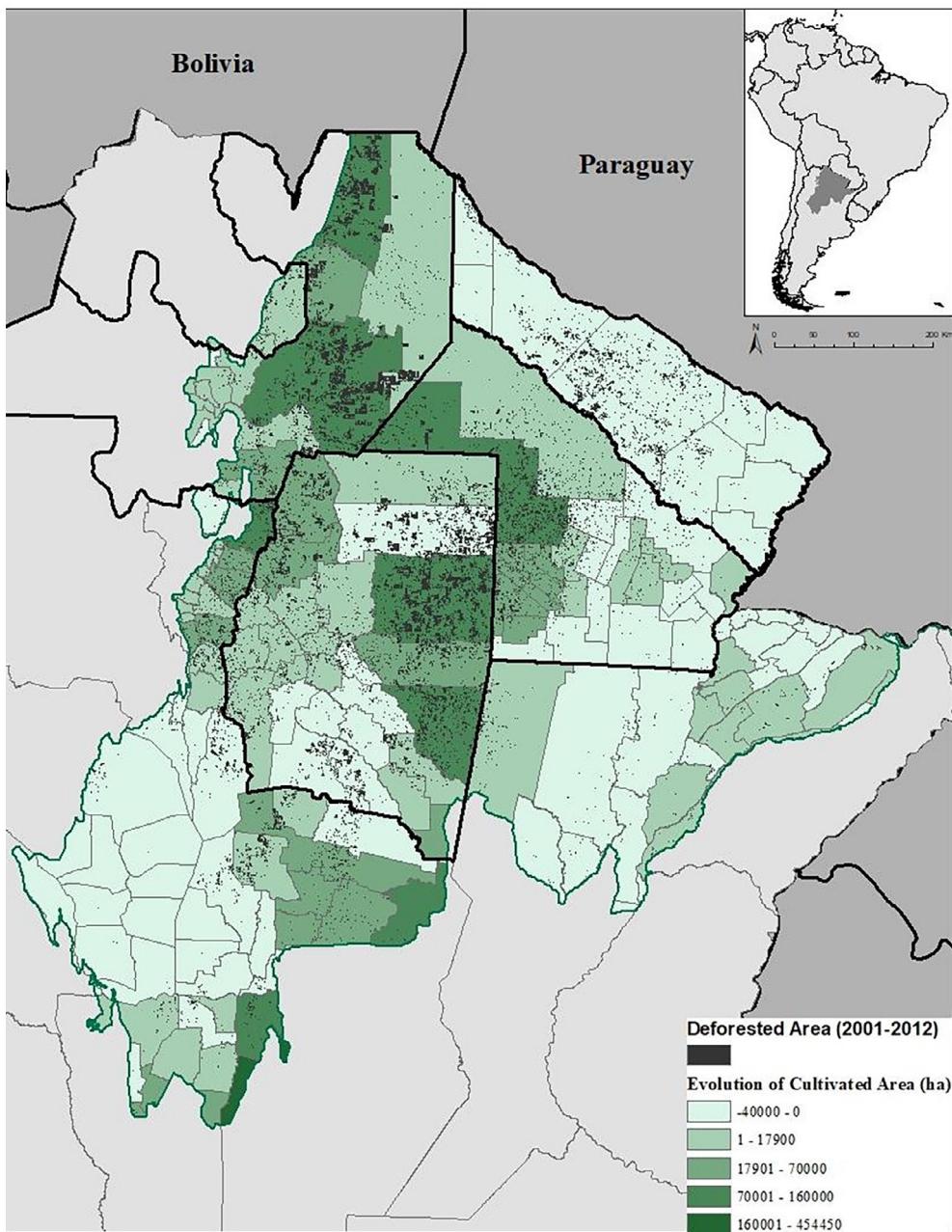
5.1. Provincial regulations (OTBNs)

We analyze the degree of consistency or agreement between the OTBNs and the NFPR, focusing on three fundamental aspects: (a) the classification of forest areas according to their conservation value (zoning map); (b) the definition of land use regulations in yellow areas, and (c) the possibility of re-categorizing the conservation value of individual farms, which the NFPR does not permit. Attributing lower conservation value to forestlands, allowing for activities that may involve clearings in yellow areas, and re-assigning individual farms to lower conservation levels all undermine the NFPR's implementation by legalizing non-compliance.

In measuring the classification of forest areas, we draw on a study of provincial zoning maps (García Collazo et al., 2013) and rank provinces in descending order according to the conservation values they assigned to their forests. Santiago and Chaco rank higher than Salta and Formosa (Table 2). To assess NFPR-OTBN consistency in land-use regulations, we focus on yellow areas because they constitute the most challenging aspect of the NFPR, as sustainable economic activities are allowed but changes to land use (i.e., clearings) are not. With the exception of Formosa, which classified 74 percent of its forest area as green, the remaining core Chaco provinces classified most of their forestlands as yellow.²⁶ The NFPR does not specify what sustainable management entails, and provinces show important variation in both the activities that are allowed and in how these activities are regulated. OTBNs allow for forest grazing and controlled timber extraction, both of which are vulnerable to "concealed clearings." In some cases, clearings for pastures are also allowed. In Chaco and Santiago, regulation is higher than in Salta and Formosa (Table 2, See Appendix D).

Finally, Formosa, Salta and Santiago permit the re-categorization of farms to lower conservation value. Salta went as far as defining its OTBN as "guidelines." Unlike Santiago, which established a technical council to determine re-categorizations, Salta's re-categorizations were determined jointly by its environmental agency—which is politically dependent on the governor—and an advisory council of large producers. Formosa in turn classified most of its forests as low-conservation value (green) and allows indigenous communities, which control most of the yellow areas, to decide whether they want to recategorize their lands.

²⁶ Between 63 and 74 percent.



Map 1. Deforestation and Soybean Expansion in the Argentine Chaco (2000–2012). Chaco Forest is the area in green. Core provinces borders are highlighted. See Appendix F for further information. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article). Source: Elaborated with data from Global Forest Watch and MAGyP-SII.

5.2. Enforcement

We employ three metrics to gauge enforcement. First, we measure deforestation in yellow and red areas, where the NFPR forbids it. Second, we measure overall deforestation rates since the enactment of the NFPR. This metric allows us to capture non-enforcement of the NFPR in provinces that misclassified forest-lands into lower conservation categories as well as to measure the deforestation that took place—and sometimes accelerated—between the enactment of the NFPR and the OTBNs, when clearings were forbidden. Sanctions constitute another potential metric for enforcement. Given the lack of cross-provincial and cross-temporal data on sanctions, we believe deforestation rates in forbidden areas are a good proxy of enforcement as sanctions are

meant to discourage clearings in those areas. Finally, we assess whether provinces re-categorized individual farms.

Deforestation in red and yellow areas is meaningful and varies across provinces. It ranges from 71.3 percent of overall deforestation in Santiago to 33 percent in Chaco (Table 2). There is also important variation in total deforestation since the approval of the NFPR, ranging from 12.9 percent of total forest loss in Santiago to 7.3 percent in Chaco. Only Salta re-categorized farms to lower conservation values between the adoption of the OTBN and 2016.

As displayed in Table 2, we find remarkable cross-provincial variation in the implementation of the NFPR. Chaco and Santiago have a stricter OTBN design but moderate and low NPFR enforcement, respectively. Salta and Formosa exhibit both low NPFR-OTBN consistency and enforcement and reveal the importance of

Table 2

Implementation of the NFPR: consistency of design and enforcement, core Chaco provinces, 2007–2016.

	Design				Enforcement			Implementation Score ⁵	
	Conservation Ranking (zoning map)	Regulation of Yellow Areas ¹	Power to Re-categorize Farms?	Consistency Score ²	Total Deforestation (% of forest) ³	Illegal Deforestation (% of total deforestation) ⁴	Re-categorized Farms?	Enforcement Score	
Chaco	2	High	No	High	7.3	33.3	No	Moderate	Moderately High
Formosa	4	Low [*]	Yes [*]	Low	7.6	N/A [*]	No	Low	Low
Salta	3	Low	Yes	Low	9.3	37.8	Yes	Low	Low
Santiago	1	High	Yes	Moderate	12.9	71.2	No	Low	Moderately Low

Sources: Elaborated with data from SAYDS, national and provincial legislation, and García Collazo et al. (2013).

^{*} The OTBN does not follow the NFPR and assigns low conservation value to three-quarters of its forestlands. Recategorizations are allowed in yellow areas controlled by indigenous communities. Remaining yellow areas are a negligible share of the overall forest area.¹ Scores based on: percent of farmland that can be (a) cleared, (b) used for grazing, and (c) the farm size threshold after which an environmental impact evaluation is required for sustainable management projects ([Appendix D](#)).² **High:** conservationism and regulation of yellow areas are high, and re-categorizations are prohibited. **Moderate:** (a) conservationism and regulation of yellow areas are high and power to re-categorize is limited; or (b) conservationism and regulation are both moderate, or one dimension is high and the other is moderate, regardless of whether re-categorizations are allowed; or (c) conservationism is high, regulation is low, and re-categorizations are prohibited. **Low:** (a) conservationism is high, regulation is low, and power to re-categorize is broad; or (b) conservationism and regulation are both low, or one dimension is moderate and the other is low ([Appendix D](#)).³ From the NFPR's enactment through 2016.⁴ From the OTBNs' enactment through 2016.⁵ Combined Consistency and Enforcement Score.**Table 3**

Land structure, core Chaco provinces, 2002.

	% Productive Land in Small Farms		% Productive Land in Large Farms		Average Farm (ha)
	(≤200 ha)	(≤500 ha)	(>2500 ha)	(>10,000 ha)	
Chaco	13.2	29	31.7	12.4	375.8
Formosa	4.69	11.1	46.2	14.8	575.7
Santiago del Estero	6.43	14.1	58.1	23.4	498
Salta	2.36	6.1	75.1	46.8	765.8

Source: Based on [Barsky and Fernández \(2008\)](#), [INDEC \(2002\)](#).

subnational regulations that legalize non-compliance (e.g., clearings in yellow areas, recategorizations) for the enforcement of national legislation.

6. Empirical evidence

6.1. Main explanatory factors

We measure the *power of large producers* using the provincial share of farmland in parcels of at least 2500 ha. We believe this is a credible way to systematically capture structural power as land is the most important asset and source of power that producers and landowners possess. We understand that large producers are powerful if they control at least half of the total farmland in a province, thereby constituting the main rural economic actor. [Table 3](#) displays the share of provincial farmland in large farms at the beginning of the commodity boom. In Salta, large producers are especially powerful; they control 75 percent of total farmland, and farms >10,000 ha comprise 47 percent of the province's total farmland. At the other extreme, Chaco has an important but smaller share of total farmland in large parcels (31 percent); thus, large producers in this province are not dominant actors in rural politics and lack the structural power that they enjoy in the other Chaco provinces. Our qualitative analysis in [Section 7](#) provides further evidence for this claim.

The existence of *conservationist coalitions* requires the presence of organized groups with the capacity for sustained collective action that oppose the expansion of the agricultural frontier and press for the enforcement of the NPFR. *Conservationist coalitions* are present in Chaco and Santiago but did not form in Salta and Formosa. In Chaco, the conservationist coalition includes the timber industry as well as indigenous communities. The timber indus-

Table 4
Design and enforcement of the NPFR in the Chaco.

	Conservationist Coalition	
	Yes	No
	Powerful Large Producers	
Chaco	Strict Design; Moderate Enforcement	Permissive Design; Low Enforcement
Santiago del Estero		Salta; Formosa

try—which represents 6.6 percent of private formal employment in the industrial sector, 10.3 percent of the province's industrial gross product, and 20 percent of its exports²⁷—has vocally opposed soybean expansion into forestlands. Its producer associations are well connected to the government and to the provincial forest agency through strong formal and informal ties.²⁸ Indigenous communities, which are numerous and well organized, have also pressed for a strict OTBN, especially through the Chaco Indigenous Institute (IDACH)—whose elected authorities represent the interests of all indigenous communities before the state.²⁹ In Santiago, lack of property titles has led small peasants to form the Santiago del Estero Peasant Movement (MOCASE), whose mobilization capacity grew during the boom ([De Salvo, 2014](#)). MOCASE has tied forest protection

²⁷ Data from National Economic Census (2004).²⁸ Authors' interviews with Luciano Olivares, Chaco undersecretary of natural resources, Resistencia, June 28, 2016, and Noe Khon, president of the Timber Industry Federation of Chaco, Resistencia, July 1, 2016.²⁹ Authors' interview with Mónica Charole, Press Director of IDACH, and Miguel Ávalos, General Secretary of IDACH, Resistencia, June 30, 2016.

Table 5

Farm size, deforestation and soybean expansion, core Chaco provinces.

	Deforestation 2001–2012 (% forests)	Deforestation 2001– 2002 (ha)	Deforestation 2006– 2014 (% forests)	Deforestation 2006– 2014 (ha)	Soy expansion 2000–2008 (ha)	Soy expansion 2001–2012 (ha)
Avg. EAP	0.18	0.44***	0.1	0.45***	0.26**	0.3***
% –0.27**	EAP < 200	–0.08	–0.31***	–0.1	–0.34***	–0.26**
% 0.38***	EAP > 2500	0.29**	0.43***	0.26**	0.44***	0.34***
% 0.34***	EAP > 5000	0.32***	0.41***	0.26**	0.42***	0.31***

N = 76 departments/municipalities in core Chaco provinces

*p < .1 **p < .05 ***p < .01.

For definitions and sources, see Appendix C.

Table 6

Assessing alternative explanatory factors.

Electoral Competition	State Capacity			Forest Area (% area 2002)	Soy Suitability Index (% area)	Implementation Score ^d
	Margin of Victory (percentage points)	Infant Mortality Ranking (2007 N = 24)	% Provincial/Total Revenue ^c (2007)			
	2007	2011 ^b				
Chaco	0.31	30.91	2	10.2	25.39	49.4
Formosa	63.10	51	1	6.9	14.47	60.9
Salta	0.80	31.8	8	22	29.51	53.2
Santiago^a	8.7	80	6	9.2	31.04	56.1

Sources: See Appendix E.

^a Elections in 2005 and 2008.^b All governors were reelected.^c Total revenue = provincial fiscal revenue + national transfers.^d See Table 2.

to the precarious land tenure and socioeconomic conditions of low-income rural populations, and has forcefully pressed for conservatism in the design and enforcement of the NFPR.³⁰ In each province, conservationist groups participated actively in the design of the OTBNs.

In Salta and Formosa, no conservationist coalitions have formed. In Salta, religious groups working with indigenous communities, universities, and national environmental NGOs have tried to influence the design and enforcement of the OTBN, but their ability to pressure the provincial government has been limited by the lack of sustained collective action on the part of affected communities.³¹ In Formosa, the peasant movement (Lapegna, 2016) and the timber industry are both small and coopted.³²

As summarized in Table 4, our theoretical expectations about governors' implementation choices as responding to the power of large producers and the presence or absence of a conservationist coalition are supported with the empirical evidence of the core Chaco provinces presented in this section and in section 4. In Salta and Formosa, we find powerful producers and no conservationist coalitions, and implementation of the NFPR in these provinces exhibits a permissive OTBN and low enforcement (top, right). In Chaco, where there is a conservationist coalition and large producers lack economic and political dominance, a strict OTBN is enforced (bottom, left). Finally, in Santiago, where we find both

large producers and a conservationist coalition, the OTBN is strict but enforcement is low.

Department-level quantitative analysis provides additional support for the hypothesized relationship between the power of large producers and enforcement in the core Chaco provinces. As Table 5 shows, farm size is significantly correlated with different measures of both soybean expansion and deforestation. Departments with a larger proportion of small farms experienced both less deforestation and soybean expansion between 2001 and 2012, while the opposite is true for departments with larger farms. If we extend the analysis to all Chaco forest departments, the relationship holds but only for total levels of deforestation.³³ In line with these findings, key producers and politicians noted in interviews the relationship between soybean cultivation and land structure.³⁴

6.2. Alternative explanatory factors

We assess whether other potential explanatory factors better account for variation in the NFPR's implementation across the core Chaco provinces (Table 6). As previously noted, some scholars posit that *electoral competition* plays an important role in policy adoption at the subnational level (Smulovitz, 2015) and shapes local authorities' decisions to enforce the law (Holland, 2016). In contexts of high electoral competition, measured by the difference

³⁰ Consejo Provincial de Bosques (2008) and interviews with MOCASE representatives, Appendix G.

³¹ See Seghezzo et al. (2011).

³² Our interviews with leaders from peasant organizations and the timber industry confirmed this. See Appendix G for a full list of interviewees.

³³ N = 170. See Appendix C.

³⁴ Authors' interviews with CRESUD director, Buenos Aires, July 23, 2014; Chaco governor Jorge Capitanich, Resistencia, June 28, 2016; Julio Soupet, Formosa's director of natural resources, Formosa, December 13, 2016; Ricardo Maglietti, vice-president of the Rural Society of Formosa, Formosa, December 16, 2016.

between the winning party and the runner-up, incumbents' incentives to effectively implement the NFPR should increase as opponents may mobilize voters around the deleterious effects of uncontrolled deforestation. However, governors in charge of designing the OTBNs—all of whom were allied with the Peronist Victory Front (PJ-FPV) that governed nationally—were elected by a slim margin (except in Formosa) and reelected easily after the OTBN's adoption. While the absence of electoral competition may help account for why Formosa's governor—who took office in 1995—was able to design an OTBN that strikingly differed from the NFPR, it does not explain why this was also the case in Salta, where the governor experienced intense competition from another PJ faction.

A substantial body of research suggests that *state capacity* is fundamental for policy implementation. Subnational states that are more capable (Levitsky & Murillo, 2013) would allow for better enforcement of the NFPR. However, core Chaco provinces exhibit similar scores on commonly used proxies of state capacity such as provincial revenue and the infant mortality rate.³⁵ At the same time, provinces received comparable national funds to build monitoring capacity, which were allocated according to the size and classification of their forestlands. None of these metrics corresponds to provinces' implementation scores.

More generally, we do not find provinces' implementation scores to be associated either with proxies of infrastructure and agricultural potential, such as proximity with the agricultural core at the department level,³⁶ or with forest area and soy suitability.

7. Case analysis: NPFR implementation in Chaco and Santiago del Estero

We further assess our causal argument and alternative explanations by analyzing the implementation of the NFPR in Chaco and Santiago del Estero. OTBNs in both provinces are consistent with the NFPR; however, their actual enforcement varies significantly. In our process tracing, we show how governors responded to conservationist coalitions in the design of critical aspects of OTBNs, and we underscore how enforcement was affected by the power of large producers, which was high in Santiago and relatively weak in Chaco, where large producers are not the main rural economic actor, resulting in variable levels of enforcement across provinces.

7.1. Designing the OTBNs

The NFPR stipulates that OTBNs should be designed through a participatory process and approved by the provincial legislature, potentially opening up two institutional spaces for social influence. Governors have the upper hand during this process, as they can make it more or less participatory, draft the original bill, and introduce changes through vetoes and decrees.

7.2. Chaco

As soon as he took office, Governor Jorge Capitanich (PJ, 2007–2013) who had served as senator during the design of the NFPR in Congress, was tasked with enacting Chaco's OTBN. Rather than catering to agricultural producers or cattle ranchers, who were not powerful in Chaco, the governor sought to regulate land use to respond to timber producers. His government perceived the OTBN as a tool for preserving forests, not only—or at least not pri-

³⁵ See Soifer (2015) and Bustikova and Corduneanu-Huci (2017).

³⁶ The correlation between deforested area and distance to the port of Rosario—which dispatches 80 percent of Argentina's grain exports—is positive, contrary to a "proximity hypothesis" suggesting more deforestation at closer distance ($R = 0.25$, $p = .003$).

marily—for forests' environmental value but also and most importantly because they fed the timber industry, a powerful sector and one of the province's main sources of private employment.³⁷ As noted by the undersecretary of natural resources: "We must look after the resource [the forests] for many reasons: first to protect the timber industry and second for environmental concerns."³⁸

In line with the NFPR, and to channel pressures into an institutional setting, the governor launched a participatory process to design the OTBN. The under-secretariat of natural resources drafted the bill, which was discussed in thirteen public hearings throughout the province with the participation of representatives from agricultural and timber producers' associations, indigenous communities and NGOs, as well as experts and provincial legislators.³⁹ As in the other core Chaco provinces, the most controversial issues were the design of the zoning map and the regulation of land use. Producers, especially investors from outside the province, pressed for a larger share of green areas in order to clear them for agriculture. Representatives from the timber industry were also interested in reduced levels of conservation, yet they clashed with the agricultural sector because they feared that if forests were classified as "green," they would be exhausted. Unlike agriculture, moreover, timber extraction could be allowed in yellow areas, and thus classifying a large share of forests as yellow would benefit timber producers at the expense of agricultural producers. National and local NGOs, as well as indigenous communities, in turn pressured the government to expand red and yellow areas to protect forestlands from large-scale agriculture.⁴⁰

In response to these diverse conservationist interests, the bill was modified to include a larger share of yellow areas⁴¹ and was approved a year later. Agricultural and timber producers vocally protested the delay in sanctioning the OTBN, demanding a clear legal framework for their activities.⁴² Revealing the clout of the timber industry, the legislature sanctioned an "emergency forestry law" giving the executive the power to authorize timber extraction while the OTBN bill was still being discussed. Clearing authorizations for agriculture, however, remained banned.⁴³ Overall, given their limited power, agricultural producers in Chaco were largely unable to significantly influence the OTBN's design, in sharp contrast with producers in the other core provinces.

7.3. Santiago del Estero

In the early 2000s, Santiago del Estero offered formidable opportunities for soy cultivation. With high agricultural suitability and large farms available at low market prices, the province lured both real estate investors and producers. As soybean prices rose, production expanded to cheaper areas unrestrained from state control. Cropland expansion increasingly affected forestlands that had historically been inhabited by peasant and indigenous communities, compounding tensions resulting from Santiago's land tenure system,⁴⁴ according to which the majority of indigenous communities and peasants, who are particularly numerous in Santi-

³⁷ Authors' interviews with Capitanich, Olivares, and Mario Olivero, advisor in the Agriculture Committee of the Chaco provincial legislature, Resistencia, June 28, 2016.

³⁸ Authors' interview with Olivares.

³⁹ REDAF (2009).

⁴⁰ Authors' interviews with Olivares, Olivero, and Khon.

⁴¹ REDAF (2009).

⁴² Federación Agraria Argentina sent a note to Chaco's legislature urging it to approve the OTBN, and timber producers organized demonstrations throughout the province (Cámara de Diputados, September 9, 2009).

⁴³ Cámara de Diputados, March 18, 2009.

⁴⁴ In Santiago, 48.3 percent of farms lack formally delimited property boundaries, and 93 percent of these non-delimited farms are occupied by peasants who lack property titles. In Chaco, in contrast, only 7 percent of farms lack formally delimited property boundaries (INDEC, 2002).

ago, lack land titles.⁴⁵ Threatened with eviction and exposed to violence, peasant and indigenous groups responded with large-scale collective action.⁴⁶

Containing social conflict fueled by the expansion of the agricultural frontier became a priority of the transitional government (2004–2005) appointed by President Néstor Kirchner as part of the federal intervention that ordered the removal and arrest of governor Nina Juarez (PJ, 2003–2004) and her husband and five-time governor Carlos Juárez. The intervention government introduced important reforms to stop deforestation and protect peasant communities. It banned forest clearings and set up a Crisis Committee with producers, peasant organizations such as MOCASE, and NGOs. It also created the Observatory of Land to help solve land disputes and issue titles to low-income occupants, promoted the revision of clearing permits, and asserted the urgent need to pass legislation on land use.⁴⁷

The momentum for reform grew under the administration of Gerardo Zamora (2005–2013) of the Civic Front, an alliance of the Radical Party and PJ politicians, which was elected by a small margin over the pro-Juárez PJ faction. With the prime goal of mitigating conflict that could destabilize his administration, Zamora inaugurated more spaces for dialogue with producers, peasants, and indigenous communities,⁴⁸ and launched a highly participatory process to debate a bill regulating land use and forest conservation. Such a law would provide Zamora with critical tools to mollify social conflict around land tenure and chaotic forest clearings⁴⁹ and would reduce legal uncertainty around agricultural and real estate investments, which he hoped to attract.⁵⁰ Drafted by technocrats, the bill was discussed and agreed upon by representatives of environmental NGOs, producers' associations, and peasant and indigenous organizations, and was approved in 2006.

The passage of the NFPR in 2007 forced the Zamora government to reopen negotiations to enact its OTBN with a new zoning map. The Provincial Forest Council—presided over by the minister of production and formed by representatives from universities and professional associations—drafted a zoning map and regulations that were debated with 140 organizations in 10 participatory workshops and in a public hearing.⁵¹

The provincial government pursued a strategy of conflict avoidance in the design of the OTBN. Intense pressure from conservationist interests—which participated actively in the discussion of the OTBN bill and denounced the poor enforcement of the 2006 provincial law—⁵² pushed the government to adjust some of the existing regulations in accordance with the NFPR. Zamora also granted some concessions to large producers, resulting in the design of an OTBN with moderate levels of conservation. The most salient innovations were the “red and green dots” in the zoning map. Red dots granted high conservation value to areas inhabited by indigenous and peasants’ communities and created buffer zones to protect them from the expansion of the agricultural frontier and its negative externalities (e.g., herbicides) even in areas that lacked any forests. “Green dots” in turn were given to individual farms in yellow zones, authorizing them to clear up to 20 percent of their

surface area for forage.⁵³ Affecting approximately 200,000 ha—5 percent of all forestlands—this provision was consistent with the existing provincial law but violated the NFPR, which forbade clearings in yellow areas.

7.4. Enforcing the NFPR

To induce compliance, governors could employ positive incentives, i.e., payment for environmental services, and negative incentives, i.e., sanctions for illegal clearings. As predicted by our framework, in both provinces governors used environmental funds to benefit the most powerful conservationist groups as a form of buying off their support, rather than prioritizing the attainment of environmental goals. While fines represent an important enforcement tool to induce compliance, governors in Santiago opted for non-enforcement as a way to favor powerful producers. In Chaco, fines were imposed more systematically due to the limited power of large producers and the importance of the conservationist coalition, but their impact on compliance was depressed by their relatively modest value.

7.5. Positive Incentives: compensatory funds

The compensatory fund⁵⁴ was intended to remunerate producers in red and yellow areas for their environmental services—i.e., their opportunity cost of preserving the forest—by subsidizing projects for conservation and for sustainable management activities. The fact that provinces only received a small proportion of the resources to which they were entitled gave governors discretion to determine who would benefit from the fund.⁵⁵ In both Santiago and Chaco, governors chose to allocate funds to appease organized groups that resisted the expansion of the agricultural frontier rather than reaching producers or landowners who could illegally engage in large-scale deforestation in the absence of positive incentives for compliance.⁵⁶ Governors in both provinces invested only a small share of resources in conservation compared to forest management projects, and they failed to prioritize medium and large producers, with the exception of timber producers in Chaco.⁵⁷ The choice to favor small producers reveals little concern for environmental impact, as small peasants are less likely to degrade the forest⁵⁸ and, moreover, the NPFR does not apply to units with less than 10 ha.

7.6. Negative incentives: fines

Representatives from forest-rich provinces strongly resisted a unified sanctions regime in Congress, only supporting the NFPR after a broad penalty scale was introduced. This granted governors discretion to design their own sanctions regime. The NFPR did establish, however, a national registry of offenders to consolidate information on violations. The Chaco provinces nonetheless refused to share information on infractions with the national government. Only Salta made this information publicly available—but the data are unsystematic and incomplete.⁵⁸ Quantitative data on fines are not available for other Chaco provinces (AGN, 2017, 184).

⁴⁵ In contrast, large-scale titling was carried out in Chaco and Formosa.

⁴⁶ Federal Interventor Lanusse described Santiago's rural conflict as “unmatched in its seriousness and extension if compared to the situation of peasants anywhere in the country” (Lanusse, 2004).

⁴⁷ Dargatz et al. (2006), De Salvo (2014), Lanusse (2004).

⁴⁸ The Land and Production Committee and the Emergency Committee were established in 2006.

⁴⁹ Authors' interviews with Publio Araujo, then provincial director of forests, Santiago, July 12, 2016; and Victor Rosales, provincial director of forests, Santiago, July 11, 2016.

⁵⁰ Authors' interview with Luis Gelid, Santiago's minister of production, Buenos Aires, July 10, 2016.

⁵¹ Consejo Provincial de Bosques (2008).

⁵² Producers and their associations prioritized this demand, Consejo Provincial de Bosques (2008).

⁵³ Fondo Nacional para el Enriquecimiento y Conservación de los Bosques Nativos.

⁵⁴ Between four and ten times lower than established in the NFPR (Di Pangracio, 2013).

⁵⁵ Data from SAyDS (2014).

⁵⁶ Authors' interviews with Victor Rosales; Liz Saieg; MOCASE representative at the “Land Occupants Registry,” Santiago, July 13, 2016. See SAyDS (2014).

⁵⁷ While commercial agriculture accounts for 70 percent of deforestation in Latin America (FAO, 2016, 9) the impact of subsistence agriculture on deforestation is minimal, especially in the Chaco Americano (De Sy et al., 2015).

⁵⁸ Available at <http://ambiente.gob.ar/infracciones-forestales/>.

Chaco's OTBN did not establish a new penalty regime but relied instead on preexisting regulations governing the timber industry. With relatively fewer powerful large producers, and facing pressure from conservationist interests, the government chose to apply fines more systematically. Fines' effect on compliance, however, was probably depressed by their low value.⁵⁹ Interviewees reported that they believed this limited compliance even after the fines were increased in 2012.⁶⁰ Unlike the other provinces, Chaco's forestry agency has a large number of local offices, totaling twenty units, tasked with extending forestry permits, controlling forest producers, and monitoring deforestation.⁶¹ This infrastructure, together with satellite imagery, has helped identify forest clearings more effectively. Non-enforcement has not been a distributional tool to compensate producers, and producers in interviews expressed fear of failing to comply with detailed requirements and receive fines, which producers in other provinces never mentioned.⁶²

In Santiago, governors facing strong producers and a conservationist coalition designed and enforced fines to cater to both sides. Conservationists managed to get strict sanctions on paper, but producers have gone unpunished. Fines in Santiago are the highest of the core Chaco provinces—Involving even the confiscation of property⁶³—and peasant organizations have been keen on denouncing illegal deforestation.⁶⁴ Although these two factors should induce both compliance and enforcement, fines are rarely issued, and few offenders have been prosecuted,⁶⁵ indicating a clear concession to large producers.

8. Conclusion

The implementation of environmental institutions in Latin America in a context of growing demand for commodities poses political and developmental challenges that deserve careful attention. These institutions impose unprecedented constraints on land use within a region that holds some of the most biodiverse land reserves and the highest potential for agricultural expansion worldwide (Graesser et al., 2015), affecting the interests of powerful landowners and investors. In the Argentine Chaco Forest, we observe substantial variation in deforestation levels and thus in the enforcement of forest protection legislation.

Our analysis shows that the effective enforcement of national environmental institutions depends not only on the application of sanctions, but also, and crucially, on the design of subnational regulations. Policymakers and multilateral and private donors seeking to reduce deforestation (see Agrawal et al., 2013) as well as researchers studying the enforcement of national laws should pay special attention to subnational implementation regulations, as affected interests may strive to influence their design in order to lower the cost of or “legalize” non-compliance.

To the best of our knowledge, this is the first systematic study that addresses the role of subnational authorities in implementing forest protection regulations in the Chaco Forest, one of the world's deforestation hotspots. In contrast with the literature that empha-

sizes the electoral aspects of institutional design and enforcement we build on a long tradition in political science and find that organized interests are critical. Facing opposing pressures to rapidly expand agriculture and ranching, and to protect and manage forestlands, governors' choices regarding the design and enforcement of the NFPR in four Argentine provinces within the Chaco were shaped by the imperative to avoid conflict, resulting in variable levels of enforcement. Specifically, when provincial conservationist coalitions were strong, provincial regulations were more protectionist. Pressure from powerful large producers in turn resulted in higher deforestation, either through governors' non-enforcement of protectionist regulations or through the design and weak enforcement of flawed regulations that allowed for legal violations of the NFPR. As the comparison between Chaco and Santiago shows, the capacity of large producers and conservationist coalitions to affect enforcement is not symmetrical. Conservationist coalitions improve enforcement only when producers are weak. When producers are strong, conservationist interests are able to influence design but are unlikely to impose enforcement on powerful producers.

By highlighting the role of large producers in determining environmental outcomes at the subnational level, this study makes two important contributions. First, while extensive political economy scholarship has analyzed the effect of large landowners on outcomes such as democratization (e.g., Acemoglu & Robinson, 2006; Boix, 2003; Moore, 1965), taxation (Fairfield, 2015), and land reform (Albertus, 2015), we show that environmental legislation is a policy domain that is increasingly relevant to large producers' core interests. Second, we argue that environmental outcomes cannot be fully understood without analyzing political factors such as the power of economic interests affected by enforcement. In this sense, deforestation studies in the environmental sciences should incorporate critical factors such as land tenure structures in their analyses.

A more general implication of this study concerns the fact that although most Latin American countries have adopted the right to a healthy environment in their constitutions, implementation depends greatly on subnational authorities, which creates the potential for unevenness in the enforcement of this right across jurisdictions. A question for future research concerns whether and how the presence of large producers and conservationist coalitions at the subnational level relates to regional disparities in environmental rights beyond the Argentine Chaco.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.worlddev.2019.02.002>.

⁵⁹ According to Chaco's forest secretary in 2012, 75 percent of the fines were under \$100 USD and only 5 percent were higher than \$6000 USD (Chaco Cámara de Diputados, December 12, 2012).

⁶⁰ Authors' interview with Olivero and Carlos Martínez, provincial legislator, Resistencia, June 27, 2016; Chaco Cámara de Diputados, December 5, 2012.

⁶¹ Chaco Provincial Direction of Forests, 2017.

⁶² Authors' interviews with Kohn and Eduardo Santos, president of the Rural Society of Chaco, Resistencia, June 27, 2016.

⁶³ Authors' interview with Raúl Abate, Santiago del Estero General Prosecutor Santiago, July 11, 2016.

⁶⁴ Authors' interviews with Rosales and MOCASE representative; *Consejo Provincial de Bosques* (2008).

⁶⁵ Authors' interview with Abate.

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